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NEXT-DAY MAIL

June 22, 1994

Mr. John Banks (3HW23)
Project Manager
U.S. Environmental Protection Agency-Region III
841 Chestnut Building
Philadelphia, PA 19107

BRODHEAD CREEK CONSENT ORDER
RISK ASSESSMENT WORK PLAN
CCN 773097-08

Dear Mr. Banks:

In accordance with Condition I.D.4. of the First Amendment to the Consent Order for the Brodhead Creek Superfund Site, enclosed please find a Work Plan for the Risk Assessment for Operable Unit 2.

Should you have any questions regarding this matter, please call Mr. James F. Villaume at (215)774-5094.

Very truly yours,

Lyn I. Ratzell
Manager
Environmental Management Division
Pennsylvania Power & Light Company

Enclosure

cc: L.J. Zelinka, Wilkes-Barre DER (Plains)
Traci I. Self, Union Gas Company

FINAL

PP&L and Union Gas

Risk Assessment Work Plan

Brodhead Creek Site/Operable Unit 2 (OU-2)

Stroudsburg, Pennsylvania

17 June 1993 94

Environmental Resources Management, Inc.
855 Springdale Drive
Exton, Pennsylvania 19341

ERM

ERM's Commitment to Quality

Our Quality Policy

We will fully understand the requirements of our clients, our jobs, and the systems that support us.

We will conform to those requirements at all times.

Our Quality Goals

To serve you.

To serve you well.

To continually improve that service.

Our Quality Improvement Process

Train each employee.

Establish and implement requirements based on a preventative approach.

Maintain a standing Quality Improvement Team to ensure continuous improvement.

Empower Corrective Action Teams at both company-wide and local levels to correct and eliminate problems.

Continually strive to improve our client and supplier relationships.

Paul H. Woodruff

Paul H. Woodruff, Chairman

Kent E. Patterson, President and C.E.O.

TABLE OF CONTENTS

1.0 INTRODUCTION

1.1 Background

In 1982 the Brodhead Creek Site was listed on the National Priorities List (NPL). On 20 August 1987, PP&L and Union Gas entered into a Consent Order Agreement with the Pennsylvania Department of Environmental Resources (PA DER) to conduct the Remedial Investigation/Feasibility Study (RI/FS) for the Brodhead Creek Site. The RI, the Risk Assessment (RA), and the FS were completed in 1990, 1990 and 1991, respectively. All of the aforementioned documents were approved by the agencies.

The U.S. EPA subsequently issued a Record of Decision (ROD) in 1991 which divided the remedial work to be undertaken at the Site into two (2) operable units. OU-1 addressed the coal tar containing subsurface soils in the stream gravel unit at the Site. The U.S. EPA identified enhanced recovery of free coal tar as an interim remedial action for OU-1. The interim remedial action for OU-1 is scheduled to be implemented during the summer/fall of 1994.

OU-2 addresses the ground water in the stream gravel to and including bedrock. PP&L, Union Gas, and ERM met with the U.S. EPA and the PA DER on 12 February 1992 to discuss and clarify the scope of work for OU-2. PP&L and Union Gas subsequently submitted a Good-Faith Offer to the U.S. EPA on 28 February 1992. A draft Administrative Order was issued on 26 March 1992. The final Administrative Order was issued on 3 June 1992.

Originally PP&L and Union Gas were going to conduct the RI and the FS and the EPA was going to conduct the RA. However, with the recent change in agency policy on performing risk assessments, the EPA agreed to let ERM perform the risk assessment on behalf of PP&L and Union Gas. An addendum to the original Consent Order reflecting that PP&L and Union Gas will perform the RA is scheduled to be issued early to mid-June 1994.

1.2 Risk Assessment Scope

The baseline risk assessment for OU-2 will focus on ground water at the Brodhead Creek site, consistent with the definition of OU-2 found in the Consent Order. Specifically, the baseline risk assessment will evaluate potential threats to human health associated with ground water exposure

and use. During a meeting with the agencies on 14 April 1994, it was agreed that the shallow and the deep aquifers would be evaluated separately in the risk assessment.

The potential for ground water discharges to Brodhead Creek and other surface water bodies was addressed during the baseline risk assessment for OU-1, and this pathway will not be re-evaluated during the OU-2 risk assessment. Similarly, the baseline risk assessment for OU-2 will not address potential risks to ecological receptors, since these issues were extensively evaluated during the baseline risk assessment for OU-1.

1.3 *Work Plan Organization*

This work plan outlines the proposed scope of work and technical approach for the risk assessment for OU-2. The Introduction includes background information and a description of the exposure scenarios to be evaluated. The proposed scope of work includes a detailed description of the protocols to be used during the performance of the risk assessment and the contents of the risk assessment report. Relevant references are also included with the work plan.

2.0 *PROPOSED SCOPE OF WORK*

2.1 *Relevant Guidance Documents*

The risk assessment will be conducted according to current U.S. EPA guidance directing the performance of risk assessments at Superfund sites. These documents include:

- *Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual/Part A* (1989);
- *Human Health Evaluation Manual/Supplemental Guidance: Standard Default Exposure Factors* (1991);
- *Risk Assessment Guidance for Superfund/Part B* (1991);
- *Dermal Exposure Assessment: Principles and Applications* (1992);
- *Guidance on Risk Characterization for Risk Managers and Risk Assessors* (1992); and

- *Supplemental Guidance to RAGS: Calculating the Concentration Term* (1992).

Additional guidance issued by EPA Region III will also be utilized in developing the risk assessment. These documents include:

- *Selecting Exposure Routes and Contaminants of Concern by Risk-Based Screening* (January 1993);
- *Exposure Point Concentrations in Ground Water* (November 1991); and
- *Chemical Concentration Data Near the Detection Limit* (November 1991).

2.2 *Proposed Risk Assessment Protocol*

The baseline risk assessment for OU-2 at the Brodhead Creek Site will be conducted in accordance with applicable U.S. EPA guidance, and will include the traditional four steps defined by the National Academy of Sciences (1983) in their report, "Risk Assessment in the Federal Government: Managing the Process." These steps are as follows:

- Identification of Constituents of Potential Concern;
- Exposure Assessment;
- Toxicity Assessment; and
- Risk Characterization.

The approach and assumptions which will be utilized in developing each of these steps are outlined in the following subsections.

2.3 *Identification of Constituents of Potential Concern*

The identification of constituents of potential concern will be performed following EPA Region III guidance (*Selecting Exposure Routes and Contaminants of Concern by Risk-Based Screening*, January 1993). Consistent with the approach outlined in this memorandum, reported concentrations of constituents in ground water will be compared to risk-based concentrations which have been derived using the toxicity data and exposure assumptions for calculating ground water levels presented in the most current Risk-Based Concentration Table (Second Quarter, 1994; prepared by Dr. R. Smith, a Senior Toxicologist at EPA Region III). Constituents whose reported concentrations exceed the risk-based concentrations will be carried forward in the risk assessment. Constituents reported at concentrations less than the risk-based screening levels will not require any further evaluation. (Note: Consistent with EPA Region III guidance on selecting constituents of concern, the target

risk level used to derive risk-based concentrations will be equal to 0.1; thus, the risk-based concentrations for noncarcinogenic constituents will differ from the values presented on the Risk-Based Concentration Table, which utilize a target risk value of 1.0).

Concentrations of inorganic constituents detected in ground water will be compared to reported concentrations in background wells. Constituents detected at concentrations which are less than or equal to background concentrations will not be evaluated further during the risk assessment.

Previous studies have identified the primary constituents of potential concern at the Brodhead Creek Site to be polycyclic aromatic hydrocarbons (PAHs), benzene, and arsenic (ERM, 1989). These constituents are commonly associated with coal tars, and their presence in soil and ground water at the Brodhead Creek Site is consistent with the past use of this facility as a coal gasification plant. It is anticipated that the results of the screening will identify these same constituents (i.e., PAHs, benzene, and arsenic) as the constituents of potential concern in the shallow ground water.

These constituents (i.e., PAHs, benzene, and arsenic) have not been detected in the bedrock aquifer, however. Indeed, only trace concentrations of organic compounds have been reported in ground water samples from the deep wells (e.g., bis(2-ethylhexyl phthalate; trichloroethene) and none of the detected compounds are coal tar related. The significance of these reported compounds will be evaluated using the screening process outlined above, and any constituents detected in the deep aquifer at concentrations exceeding screening levels will be evaluated in more detail during the risk assessment.

If appropriate, other criteria may also be utilized to identify constituents of potential concern during the baseline risk assessment. These include the frequency of a constituent's detection in a given medium (e.g., deep ground water, shallow ground water), and the detection of a constituent in other media (U.S. EPA, 1989). Detailed justification will be provided for any constituents not carried through the risk assessment.

2.4 *Exposure Assessment*

This task includes identification of any potentially exposed populations, considering both current and realistic future use conditions of the site; identification of the exposure scenarios to be evaluated in the risk assessment; calculation of exposure point concentrations; and estimation

of chemical intakes for the defined populations, using appropriate assumptions to characterize the defined exposures.

Under current and reasonably foreseeable future use conditions, there are no users of ground water from either the shallow or the deep aquifers in the vicinity of the Brodhead Creek site. Furthermore, it should be noted that any use of ground water from the shallow aquifer is very unlikely in light of the poor yield of this water-bearing unit. However, in order to meet the requirements of the EPA for developing baseline risk assessments, this risk assessment will evaluate the potential risks associated with the hypothetical use of ground water as a residential water supply. The risk assessment will consider ground water use by both adults and young children (U.S. EPA, 1991a), and will evaluate all three potential routes of exposure associated with the residential use of ground water (i.e., ingestion of ground water, dermal contact with ground water during bathing, and inhalation of volatile constituents released from ground water; it should be noted that this last route is only applicable in the event that any volatiles are selected as constituents of potential concern).

The shallow aquifer and the deep (bedrock) aquifers will be considered separately in the exposure assessment, following the interpretation of the site hydrogeology presented in the RI report for OU-2. Thus, two exposure scenarios will be developed: hypothetical residential use of ground water from the shallow aquifer, and hypothetical residential use of ground water from the bedrock aquifer. It should be noted that this second scenario will only be evaluated if constituents of potential concern are identified in the bedrock aquifer.

Exposure point concentrations will be calculated according to applicable guidance (U.S. EPA, 1989, 1992b; U. S. EPA Region III, 1991, 1991a). Both average and upper bound concentrations will be calculated (U.S. EPA, 1992a), and, consistent with the two defined exposure scenarios, these calculations will be performed separately for shallow and deep ground water. Following current guidance (U.S. EPA, 1989), the upper bound concentration will be equal to the 95th percentile upper confidence limit of the arithmetic mean. Data will be reviewed to determine whether they are distributed normally or log-normally, and calculation of the mean will be based on the most appropriate methodology for the specific distribution (U.S. EPA, 1992b).

Intake calculations will also be made following the methods presented in applicable guidance (U.S. EPA, 1989). Exposure assumptions used in the

intake calculations will be based on the standard default exposure assumptions presented in U. S. EPA guidance (U.S. EPA, 1989, 1991).

2.5 *Toxicity Assessment*

Current toxicity data (i.e., carcinogenic slope factors and reference doses) will be identified for each constituent of potential concern from U.S. EPA toxicity databases, and if appropriate, from peer-reviewed literature. It is expected that the primary sources of toxicity information used in the baseline risk assessment will be the Integrated Risk Information System or IRIS (an on-line toxicity data base updated monthly by U.S. EPA), and the Health Effects Assessment Summary Tables or HEAST (published by U.S. EPA). Equivalency factors will be used to relate the toxicity of the carcinogenic PAHs to benzo(a)pyrene, following current U.S. EPA guidance (U.S. EPA, 1993).

Both inhalation and oral toxicity indices will be presented, when available, in the toxicity assessment. Constituents without published toxicity indices will be evaluated by ERM's Senior Toxicologist, and a recommendation for an appropriate value or set of values will be developed based on a review of published information regarding the constituent's toxicology. These recommendations will be reviewed with the Region III toxicologist prior to their use in the risk assessment.

In addition to presenting numeric toxicity indices, the risk assessment will include brief toxicity profiles prepared for the major constituents of potential concern. These profiles will present a discussion of the mechanisms by which these constituents induce toxicity, in order to provide additional perspective regarding the significance of the risk assessment results.

2.6 *Risk Characterization*

In the final step of the risk assessment, the results of the exposure assessment (i.e., the calculated intakes) will be integrated with the toxicity information to derive quantitative estimates of potential risk associated with the defined exposure scenarios. Risk estimates will be calculated following the standard procedures defined in U.S. EPA's Risk Assessment Guidance for Superfund/Part A (U. S. EPA, 1989), and the results will be compared to levels of acceptable risk defined by U.S. EPA (U. S. EPA, 1990).

Carcinogenic risk will be calculated as a product of the constituent intake and the chemical-specific carcinogenic slope factor; under each defined

scenario (e.g., hypothetical residential use of shallow ground water), estimated risks for each carcinogenic constituent will be summed to derive a total risk associated with a specific route of exposure (e.g., ingestion); similarly, risks from concurrent routes of exposure (i.e., ingestion, dermal contact, and inhalation) will also be summed to derive a total risk for a potentially exposed population under a specific scenario. The resulting risk will be compared to acceptable levels of risk defined by U.S. EPA (1990) in the National Oil and Hazardous Substances Pollution Contingency Plan (i.e., 1×10^{-6} to 1×10^{-4}).

Noncarcinogenic hazard will also be calculated according to the methods described in Risk Assessment Guidance for Superfund/Part A (U.S. EPA, 1989). A hazard quotient will be computed for each constituent by determining the ratio of the calculated chemical intake to the appropriate reference dose. Hazard indices will then be calculated as the sum of all appropriate hazard quotients, in order to fully evaluate the potential noncarcinogenic hazard associated with a defined exposure. If necessary, hazard indices will be segregated according to target organ effect to more accurately assess the potential for adverse health effects to occur as a result of the defined conditions of exposure.

2.7 *Reporting*

The methodology and results of each of the four steps in the risk assessment will be summarized in a report, and a draft copy submitted to PP&L and Union Gas for review. Following receipt and discussion of comments on the draft baseline risk assessment, the report will be revised and issued to the agencies.

In addition to describing the baseline risk assessment, the report will present a comparison of ground water sampling data to Maximum Contaminant Levels (MCLs) in order to provide additional perspective regarding the results of the risk assessment. MCLs represent potential ARARS (Applicable or Relevant and Appropriate Requirements) for ground water, and are frequently cited as ground water cleanup levels.

The report will also contain, at a minimum, a qualitative discussion of the uncertainties associated with each step of the risk assessment, and an evaluation of the significance of those uncertainties. This information is an integral part of any risk assessment because it provides important insight into the significance of the risk assessment results, thus supporting risk management decisions. This discussion will include evaluation of the uncertainties associated with the risk assessment process itself as well as the specific assumptions used in developing the baseline risk assessment.

It is expected that a qualitative discussion of uncertainty will be sufficient to provide the perspective needed to support future risk management decisions at this site. However, if more rigorous assessment of uncertainties is required, then other techniques (e.g., Monte Carlo simulation) will be considered.

A proposed table of contents for the risk assessment report is included as Attachment A.

3.0 *REFERENCES*

ERM, Inc. 1989. Risk Assessment for the Brodhead Creek Site, Stroudsburg, PA. August, 1989.

ERM, Inc. 1994. Remedial Investigation for the Brodhead Creek Site/OU-2, Stroudsburg, PA.

National Academy of Sciences. 1983. Risk Assessment and the Federal Government: Managing the Process.

U.S. EPA. 1988. Guidance on Conducting Remedial Investigations/ Feasibility Studies at Superfund Sites.

U.S. EPA. 1989. Risk Assessment Guidance for Superfund/Volume 1: Human Health Evaluation Manual (Part A).

U.S. EPA. 1990. National Oil and Hazardous Substances Pollution Contingency Plan.

U.S. EPA. 1991. Human Health Evaluation Manual/Supplemental Guidance: Standard Default Exposure Factors.

U.S. EPA. 1991a. Risk Assessment Guidance for Superfund/Part B: Development of Preliminary Remediation Goals.

U.S. EPA. 1992. Dermal Exposure Assessment: Principles and Applications.

U.S. EPA. 1992a. Guidance on Risk Characterization for Risk Managers and Risk Assessors.

U.S. EPA. 1992b. Supplemental Guidance to RAGS: Calculating the Concentration Term.

U.S. EPA. 1993. Provisional Guidance for Quantitative Risk Assessment of Polycyclic Aromatic Hydrocarbons.

U.S. EPA Region III. 1991. Chemical Concentration Data Near the Detection Limit.

U.S. EPA Region III. 1991a. Exposure Point Concentrations in Ground Water.

U.S. EPA Region III. 1993. Selecting Exposure Routes and Contaminants of Concern by Risk-Based Screening (January 1993).

U.S. EPA Region III. 1994. Risk-Based Concentration Table, Second Quarter, 1994.

Attachment A
Proposed Table of Contents
Risk Assessment Report
Brodhead Creek Site, OU-2

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Proposed Table of Contents
Risk Assessment Report
Brodhead Creek Site, OU-2

PROPOSED TABLE OF CONTENTS
RISK ASSESSMENT REPORT
BRODHEAD CREEK SITE, OU-2

PROPOSED TABLE OF CONTENTS (CONTINUED)
RISK ASSESSMENT REPORT
BRODHEAD CREEK SITE, OU-2